

Section 1: Multiple choice and True/False (5marks)

1. In a conceptual model for a university, which of the following could most appropriately be represented via a recursive relationship?
 - a) Student credit hours.
 - b) Parking sticker assignments.
 - ☒ c) Course prerequisites.
 - d) Final exam schedules.
2. _____ attribute can be divided in to smaller subparts, which represent more basic attributes with independent meaning.
 - a) simple
 - ☒ b) composite
 - c) multi valued
 - d) derived
3. The _____ operation defines a relation that is the concatenation of every tuple of relation R with every tuple of relation S.
 - ☒ a) Cartesian product ($R \times S$)
 - b) Set difference ($R - S$)
 - c) Natural join ($R \bowtie S$).
 - d) Intersection ($R \cap S$).
4. The degree of a relationship refers to _____.
 - a) Number of attributes in an entity.
 - b) Number of attributes in a relation.
 - c) Number of entities in an ER diagram.
 - ☒ d) Number of participated entities in the relationship.
5. Selection and Projection operations are _____ operations
 - a) unary
 - ☒ b) binary
 - c) ternary
 - d) Depend on the query
6. Entity occurrence is a group of objects with the same properties, which are identified by the enterprise as having an independent existence.
 - ☒ a) True
 - b) False
7. Superclass is an entity type that includes one or more distinct subgroupings of its occurrences.
 - ☒ a) True
 - b) False
8. Strong entity type is also called subordinate entity type
 - a) True
 - ☒ b) False
9. A fan trap may exist where two or more 1:* relationships fan out from the same entity.
 - ☒ a) True
 - b) False
10. In relation algebra, the aggregate functions consist of Sum, Min, Max, Average, and Join.
 - a) True
 - ☒ b) False

Section 2: Relational Algebra (5 marks)

Given the tables below, formulate the following queries in Relational Algebra.

FILM

FILM-NO	FILM-TITLE
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ACTOR

ACTOR-NO	ACTOR-NAME	ACTOR-ADDRESS	SEX
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FILM-ACTOR

FILM-NO	ACTOR-NO	SALARY
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- a. List the titles of all films.

$\pi_{\text{FILM-TITLE}} (\text{FILM})$

1.5

- b. List the names of all female actresses.

$\pi_{\text{ACTOR-NAME}} (\sigma_{\text{sex} = \text{'female'}} (\text{ACTOR}))$

1.5

- c. For each film, find the number of actors/actresses and the sum of their salaries.

$\rho_R (\text{NumOfActors, SumSalary}) \bowtie \text{COUNT}(\text{ACTOR-NO}), \text{SUM}(\text{SALARY}) (\text{FILM-ACTOR})$

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Section 3: ER Diagram (5 marks)

In a company database, you need to store information about employees (identified by CPR number, with salary and phone number as attributes), departments (identified by department number, with department name and budget as attributes), and children of employees (with name and age as attributes). Employees work in departments; each department is managed by an employee; a child can only be identified uniquely (by name) when the parent (who is an employee) is known. Assume that only one parent works for the company.

Q: Draw an ER diagram that captures the above information showing (entities of the model with their corresponding attributes, key attributes, and relationships).

